

## ***Interactive comment on “Surface pressure retrieval from SCIAMACHY measurements in the O<sub>2</sub> A Band: validation of the measurements and sensitivity on aerosols” by B. van Diedenhoven et al.***

### **Anonymous Referee #2**

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Surface Pressure retrieval from SCIAMACHY measurements in the O<sub>2</sub> A Band: validation of the measurements and sensitivity on aerosols. B. van Diedenhoven, O.P. Hasekamp, and I. Aben.

There are two main parts in the paper. The first part shows radiative transfer simulation result that show the effect of atmospheric aerosol on the retrieval of surface pressure from measurements in the oxygen absorption band at 765 nm. In the second part, the authors analyze SCIAMACHY estimates of the surface pressure. They show that

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the errors are generally consistent with the results of radiative transfer simulations. On the other hand, there is also a need to correct the Sciamachy data for a “continuum reflectance” bias. In general, the paper is well written and clear. I have very few specific comments. On the other hand, I do not like the fact that the “1% continuum correction” appears very empirical. I very strongly suggest to comment further this correction. What is the physical cause for such error in the Sciamachy data ? Is that something that applies to other bands ? Do the authors recommend this correction to all other studies that use Sciamachy data ? In the radiative transfer simulation part, I am surprise there is no discussion on the solar/view angle. I would expect that, for low sun/view zenith angle, an elevated aerosol layer would lengthen the atmospheric path, resulting in an increased apparent pressure, while the opposite would be true for high sun/view zenith angles. Do the authors agree ? Does it show on the simulations ?

The analysis with MISR data is very qualitative. For a better analysis, I would suggest a scatter plot of  $\Delta P$  as a function of MISR aerosol optical thickness. Another (better) option would be so simulate  $\Delta P$  from the results shown in Fig.2, the aerosol optical thickness from MISR, and the retrieved surface pressure. The simulated  $\Delta P$  could then be shown against the “real”  $\Delta P$ . This would demonstrate ho much of the error can be attributed to this aerosol effect. I realize there is some uncertainty on the aerosol height, but typical profile for the Sahara at this period of the year are available and would provide a proper first guess.

Specific comments: Abstract: we show that for low to moderate aerosol loads or high surface albedo (aerosol loads to be added) Section 4.1: Data. I am rather surprised by the correction factor of 1.2. A 20% correction on the absolute calibration is very large. How does one explain such a large error on the official calibration ?

1) Does the paper address relevant scientific questions within the scope of ACP? The paper is well in the scope of ACP. It provides significant results for the use of absorption spectroscopy for the retrieval of atmospheric composition from spaceborne measurements. This paper will also be of specific interest to the community that uses the

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sciamachy measurements.

2) Does the paper present novel concepts, ideas, tools, or data? The first part of the paper is not new, as several similar studies have been presented in the past. It is however appropriate as it allows a physical interpretation of the second part of the paper that deals with real data.

3) Are substantial conclusions reached? There are substantial conclusions in the sense that measurements confirm the results of simulations studies on the impact of aerosol on the apparent pressure from the oxygen A-band. It also presents substantial conclusions on the quality of Sciamachy measurements.

4) Are the scientific methods and assumptions valid and clearly outlined? Yes

5) Are the results sufficient to support the interpretations and conclusions? Yes

6) Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Yes

7) Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes

8) Does the title clearly reflect the contents of the paper? Yes

9) Does the abstract provide a concise and complete summary? Yes

10) Is the overall presentation well structured and clear? Yes

11) Is the language fluent and precise? I believe it could be improved, but I am not the right person to judge on the quality of the English

12) Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Yes

13) Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? Fig. 4 is not necessary Fig. 10 does not bring much infor-

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mation and could be replaced by a scatter plot (see general comment).

14) Are the number and quality of references appropriate? Yes

15) Is the amount and quality of supplementary material appropriate? NA

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Interactive comment on Atmos. Chem. Phys. Discuss., 5, 1469, 2005.

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